

### **REMARKS**

Applicants have carefully reviewed and considered the Office Action mailed on November 20, 2002, and the references cited therewith.

Claims 11-27 were canceled earlier in the Response to the Restriction Requirement filed March 27, 2002. No claims are amended or canceled by way of the present "Amendment and Response Under 37 CFR §1.111". New claims 41-50 have been added. As a result, claims 1-10 and 28-50 are now pending in this application.

For the convenience of the Examiner, Applicants' remarks concerning the claims will be presented in the same order in which the Examiner presented them in the Office Action.

### **Amendments to the Specification**

On page 1, Applicants have updated the status of related applications.

In the paragraph beginning on page 8, line 1, the written description has been amended to state that "Between the plates 141 and 151 is an insulating layer of a high permittivity material." Support may be found, for example, in the original written description on page 10, lines 6-9. This amendment was made to provide support for the term "insulating layers" in newly added claim 41.

On page 10, between lines 13 and 14, two new paragraphs have been inserted. These two paragraphs describe elements and geometrical relationships that are shown in FIG. 3 but that were not previously described in detail in the written description. These features are now described to provide antecedent support for corresponding language in newly added claims 41-50.

In addition, Applicants have made several amendments to the specification by substituting "embodiments of the invention", "subject matter", or "disclosure" for "invention". This is because Applicants do not wish the claims to be interpreted as being limited to a single "invention".

No new matter has been added by way of these amendments to the specification.

### New Claims 41-50

New claims 41-50 have been added to provide Applicants with additional protection to which Applicants are entitled and which are supported by the original disclosure. No new matter has been introduced.

Independent claim 41 recites a multilayer substrate to mount a die comprising a ceramic portion and an organic portion. The ceramic portion comprises an upper surface and a lower surface and includes a capacitor located between the upper and lower surfaces. The capacitor includes a plurality of conductive layers interleaved with insulating layers. The plurality of conductive layers comprise a first plurality of conductive layers to be at a first potential, and a second plurality of conductive layers to be at a second potential. Selected ones of the first plurality of conductive layers are electrically coupled to at least a first via that penetrates an adjacent one of the second plurality of conductive layers without electrically contacting same. Selected ones of the second plurality of conductive layers are electrically coupled to at least a second via that penetrates an adjacent one of the first plurality of conductive layers without electrically contacting same. The capacitor includes a first terminal electrically coupled to the first via, and a second terminal electrically coupled to the second via.

Still referring to new independent claim 41, the organic portion comprises an upper surface having a first plurality of lands thereon, including a first land coupled to the first terminal and a second land coupled to the second terminal. The first and second lands are positioned to couple to corresponding power supply nodes of the die. The organic portion further includes a plurality of conductors, including a first conductor coupling the first land to the first terminal and a second conductor coupling the second land to the second terminal.

Support for claim 41 may be found, for example, in FIG. 3 and in the corresponding written description of FIG. 3, including the newly added paragraphs on page 10.

Dependent claim 42 recites that the first via has a projection upon a selected one of the first plurality of conductive layers that is surrounded by the selected one of the first plurality of conductive layers. Support may be found, for example, in FIG. 3 and in the newly added paragraphs on page 10.

Dependent claim 43 recites that the second via has a projection upon a selected one of the second plurality of conductive layers that is surrounded by the selected one of the second plurality of conductive layers. Support may be found, for example, in FIG. 3 and in the newly added paragraphs on page 10.

Dependent claim 44 recites that the insulating layers comprise high permittivity material. Support may be found, for example, in the paragraph beginning on page 8, line 1, as amended.

Dependent claim 45 is identical to original claim 10.

Dependent claims 46-50 are identical to previously added claims 32-36.

#### **Rejections Under 35 U.S.C. §112, Second Paragraph**

Claims 1-10 and 28-40 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner merely stated that Applicants should clarify the claimed structures and did not point out any specific instances.

Applicants have carefully reviewed claims 1-10 and 28-40, and Applicants respectfully assert that these claims meet the requirements of 35 U.S.C. §112, second paragraph. It is hoped that Applicants' comments in the section hereinabove entitled "In the Drawings" have aided the Examiner's understanding of the subject matter claimed in claims 1-10 and 28-40.

Should the Examiner have any remaining concerns that claims 1-10 and 28-40 satisfy the requirements of 35 U.S.C. §112, second paragraph, Applicants respectfully request the Examiner to make them known in a subsequent Office Action.

#### **Rejection Under 35 U.S.C. §103(a) of Claims 1-10 and 28-40 as unpatentable over Arima in view of Branchevsky**

Claims 1-10 and 28-40 were rejected under 35 U.S.C. §103(a) as being unpatentable over Arima et al. (U.S. Patent No. 5,281,151) in view of Branchevsky (U.S. Patent No. 6,252,761).

Arima discloses a first multi-layer wiring conductor in the form of a multi-layer ceramic board 2, and a second multi-layer wiring conductor in the form of a thin-film circuit board 3 having laminated organic layers (see col. 2, line 65 through col. 3, line 22 and FIG. 1). An

integrated circuit 9 is mounted on the thin film circuit 3. It is noted that Arima does not appear to contain any disclosure concerning an internal capacitor.

Branchevsky discloses a multi-layer ceramic capacitor 100 (FIG. 9, see col. 4, lines 16-18). One set of electrodes (110, 118, and 126) and a second set of electrodes (114 and 122) are separated by dielectric layers (112, 116, 120, and 124). A via 128 contacts the left-hand side (as seen in FIG. 9) of electrodes 110/118/126, and a via 130 contacts the right-hand side of electrodes 114/122. Also, in FIGS. 1-8 of Branchevsky, various prior art structures of ceramic substrates having embedded capacitors are shown. It is noted that Branchevsky does not appear to contain any disclosure concerning an organic substrate.

The Examiner stated that it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Branchevsky's teachings with Arima's substrate for the purpose of increasing capacitance. Applicants respectfully disagree for the following reasons.

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation in the references, or in the knowledge generally available to one of ordinary skill in the art, to combine them to arrive at Applicants' claimed subject matter.

Independent claim 1 recites *inter alia* a multilayer substrate comprising a ceramic portion having an embedded capacitor, and an organic portion comprising a plurality of conductors. There is no suggestion or motivation in Branchevsky or Arima for combining these references to arrive at the subject matter claimed in claim 1. As pointed out earlier, Branchevsky does not appear to contain any disclosure concerning an organic substrate, nor any suggestion of combining an organic substrate with the ceramic substrate shown in Branchevsky. Nor does Arima appear to contain any disclosure concerning providing an internal capacitor. Applicants respectfully assert that the suggested combination of Arima and Branchevsky is based solely upon hindsight and would not have been suggested but for Applicants' own disclosure.

For the above reasons, claim 1 should be found to be allowable over any combination of Arima and Branchevsky, and Applicants respectfully request that the rejection of claim 1 under 35 U.S.C. §103(a) as being unpatentable over Arima in view of Branchevsky should be withdrawn.

Claims 2-10, which depend from claim 1 and incorporate all of the limitations therein, are also asserted to be allowable for the reasons presented above.

Independent claim 28 recites a method for making a substrate to package a die. The method comprises *inter alia* forming a first portion of the substrate using ceramic materials and including at least one capacitor between upper and lower surfaces of the first portion. The method further comprises *inter alia* forming a second portion of the substrate using organic materials, the second portion overlying the first portion. Again, there is no suggestion or motivation in Branchevsky or Arima for combining these references to arrive at the subject matter claimed in claim 28. As pointed out earlier, Branchevsky does not appear to contain any disclosure concerning forming an organic substrate, or combining an organic substrate with the ceramic substrate shown in Branchevsky. Nor does Arima appear to contain any disclosure concerning including an internal capacitor within the ceramic substrate. Applicants respectfully assert that the suggested combination of Arima and Branchevsky is based solely upon hindsight and would not have been suggested but for Applicants' own disclosure.

For the above reasons, claim 28 should be found to be allowable over any combination of Arima and Branchevsky, and Applicants respectfully request that the rejection of claim 28 under 35 U.S.C. § 103(a) as being unpatentable over Arima in view of Branchevsky should be withdrawn.

Claims 29-30, which depend from claim 28 and incorporate all of the limitations therein, are also asserted to be allowable for the reasons presented above.

Independent claim 31 recites *inter alia* a multilayer substrate comprising a ceramic portion including a capacitor located between upper and lower surfaces, and an organic portion comprising a plurality of conductors. Again, there is no suggestion or motivation in Branchevsky or Arima for combining these references to arrive at the subject matter claimed in claim 31. As pointed out earlier, Branchevsky does not appear to contain any disclosure concerning an organic substrate, or combining an organic substrate with the ceramic substrate shown in Branchevsky. Nor does Arima appear to contain any disclosure concerning including an internal capacitor within the ceramic substrate. Applicants respectfully assert that the

suggested combination of Arima and Branchevsky is based solely upon hindsight and would not have been suggested but for Applicants' own disclosure.

For the above reasons, claim 31 should be found to be allowable over any combination of Arima and Branchevsky, and Applicants respectfully request that the rejection of claim 31 under 35 U.S.C. § 103(a) as being unpatentable over Arima in view of Branchevsky should be withdrawn.

Claims 32-40, which depend from claim 31 and incorporate all of the limitations therein, are also asserted to be allowable for the reasons presented above.

#### **Allowability of New Claims 41-50**

New independent 41 recites *inter alia* a multilayer substrate comprising a ceramic portion including a capacitor located between upper and lower surfaces, and an organic portion comprising a plurality of conductors. The capacitor includes a plurality of conductive layers interleaved with insulating layers. The plurality of conductive layers comprise a first plurality of conductive layers to be at a first potential, and a second plurality of conductive layers to be at a second potential.

Independent claim 41 additionally recites that selected ones of the first plurality of conductive layers are electrically coupled to at least a first via that penetrates an adjacent one of the second plurality of conductive layers without electrically contacting same. Selected ones of the second plurality of conductive layers are electrically coupled to at least a second via that penetrates an adjacent one of the first plurality of conductive layers without electrically contacting same. This capacitor structure is not shown or described in Branchevsky.

Again, there is no suggestion or motivation in Branchevsky or Arima for combining these references to arrive at the subject matter claimed in new claim 41. As pointed out earlier, Branchevsky does not appear to contain any disclosure concerning an organic substrate, or combining an organic substrate with the ceramic substrate shown in Branchevsky. Nor does Arima appear to contain any disclosure concerning including an internal capacitor within the ceramic substrate. Applicants respectfully assert that any suggested combination of Arima and

Branchevsky would be based solely upon hindsight and would not have been suggested but for Applicants' own disclosure.

For the above reasons, claim 41 should be found to be allowable over any combination of Arima and Branchevsky. Claims 42-50, which depend from claim 41 and incorporate all of the limitations therein, are also asserted to be allowable for the reasons presented above.

#### **Additional Elements and Limitations**

Applicants consider additional elements and limitations of claims 1-10 and 28-50 to further distinguish over the cited references, and Applicants reserve the right to present arguments to this effect at a later date.

#### **Documents Cited But Not Relied Upon For This Office Action**

Applicants need not respond to the assertion of pertinence stated for the references cited but not relied upon by the Office Action, because these references are not made part of the rejections in this Office Action. Applicants are expressly not admitting to this assertion and reserve the right to address the assertion should it form part of future rejections.

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Title: ELECTRONIC ASSEMBLY COMPRISING CERAMIC/ORGANIC HYBRID SUBSTRATE WITH EMBEDDED CAPACITORS  
AND METHODS OF MANUFACTUREConclusion

Applicants respectfully submit that claims 1-10 and 28-50 are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicants' attorney Walter W. Nielsen at 602/298-8920 or the below signed attorney to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on this 20 day of February, 2003.

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